

Appl. No. 09/546,174  
Amdt. dated February 3, 2004  
Reply to Office action of December 23, 2003

### REMARKS

Applicant's representative thanks Examiner Sergeant for granting a telephonic interview on January 28, 2004 to discuss the outstanding Office Action in this case. In the Office Action mailed December 23, 2003, the claims were rejected under 35 U.S.C. § 112. In addition, claims 50, 52-55, 59-61, and 63-69 were rejected under 35 U.S.C. § 102(e)/103(a) over U.S. Patent No. 5,854,126 to *Tobben et al.* Finally, claims 56-58 were rejected under 35 U.S.C. § 103(a) over *Tobben*.

Claims 50 and 61 are amended to recite that the cap layer has a thickness and composition adapted such that "said cap layer uses an interference behavior to reduce reflections." Support for this amendment is found in the specification at page 11, lines 3-9. Claim 80 is amended to replace the "first plasma based process" with a "HDPCVD process," and the "second plasma based process" with a "different plasma process." Support for this amendment can be found in the specification, page 12 line 26 to page 13, line 4 which describes first depositing a dielectric material with HDPCVD followed by a deposition of dielectric material with another plasma process (*i.e.*, PECVD).

Finally, the amendment adds claims 94-97 to address the antecedent basis for the protective layer in claims 75-77. Support for claim 94 can be found in claim 61, which includes both a cap layer and a protective layer, and support for claims 95-97 comes from claims 75-77. No new matter has been added by the amendment and claims 50-74 and 78-97 are pending in the application. Reconsideration and withdrawal of the rejections are respectfully requested in light of the amendment and the remarks that follow.

#### A. The Rejection under § 112, 1<sup>st</sup> paragraph, over Adapting the Composition of the Cap Layer is Addressed

Claims 50-79 were rejected under 35 U.S.C. § 112, 1<sup>st</sup> paragraph, due to an alleged lack of enablement for adapting the composition of the cap layer to reduce the amount of light reflected at the interface of the cap layer with an underlying layer. This rejection is respectfully traversed.

Claims 50 and 61, as amended, recite:

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said cap layer has a thickness and a composition which are adapted so that at least during a photolithographic process said cap layer uses an interference behavior to reduce reflections.

Support and enablement for adapting the composition of the cap layer to use interference to reduce reflections can be found on page 11, lines 3–13 of the specification. This section describes how cap layer 28 may function as an interference antireflection layer that uses interference to prevent light from passing through the cap layer and reflecting back up to the photoresist layer. The specification (page 11, lines 9–11) notes that those of ordinary skill in the art appreciate that for the cap layer to act as a quarter wave plate (e.g. one preferred form of an interference antireflection layer) it should be adapted to have a particular thickness and composition that depends on the wavelength of light being attenuated:

Those of ordinary skill in the art will appreciate that the particular thickness of [cap] layer 28 to be provided when layer 28 has its preferred function as a quarter wave plate is different for different materials. The preferred thickness for layer 28 can be determined by setting the thickness to be one quarter of the wavelength of the exposure light taking into account the dielectric constant of the material in layer 28 at the wavelength of the exposure light.

This passage, among others, instructs one of skill in the art how to adapt the thickness and composition of the cap layer of the present invention to function using interference to reduce reflections without undue experimentation. Accordingly, withdrawal of this rejection under § 112, 1<sup>st</sup> paragraph is respectfully requested.

B. The Rejection under § 112, 2<sup>nd</sup> paragraph, over "if the cap layer is not present" Language is Addressed

Claims 50–79 were rejected under 35 U.S.C. § 112, 2<sup>nd</sup> paragraph, because the term "if the cap layer is not present" in claims 50 and 61 is allegedly unclear. This rejection is made moot by the amendment, which rephrases the description of the cap layer and eliminates this term. Accordingly withdrawal of this rejection is respectfully requested.

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C. The Rejection under § 112, 2<sup>nd</sup> paragraph, over Filling the Gaps with Dielectric Material is Addressed

Claims 61–64, 66–74 and 79 were rejected under 35 U.S.C. § 112, 2<sup>nd</sup> paragraph, because there was no recitation in claim 61 of any process steps that result in gaps being filled. This rejection is made moot by the amendment, where claim 61 now recites:

forming a layer of the dielectric material, comprising high density plasma chemical vapor deposition (HDPCVD) dielectric material, on surfaces exposed by the etching process including exposed surfaces of the cap layer, *wherein the gaps are substantially filled with the dielectric material.*

Accordingly, withdrawal of this rejection of claims 61–64, 66–74 and 79 under § 112, 2<sup>nd</sup> paragraph, is respectfully requested.

D. The Rejection under § 112, 2<sup>nd</sup> paragraph, over Antecedent Basis for the Protective Layer is Addressed

Claims 75 and 76 were rejected under 35 U.S.C. § 112, 2<sup>nd</sup> paragraph, because the recited “protective layer” lacks antecedent basis from claim 52. This rejection is made moot by the amendment.

The amendment cancels claims 75 and 76 and presents new claims 95 and 96, which depend from claim 94. Claim 94 includes antecedent basis for a protective layer formed on the upper surface of the wiring line layer in the method of claim 50. In light of the amendment, withdrawal of this rejection is respectfully requested.

E. The Rejection under § 112, 1<sup>st</sup> paragraph, over the term “uniform thickness” Addressed

Claims 50–93 were rejected under 35 U.S.C. § 112, 1<sup>st</sup> paragraph, due to an alleged lack of support for the term “uniform thickness.” This rejection is made moot by the amendment.

Claims 50 and 61, as amended, delete the word “uniform” from the description of the thickness of the cap layer. In light of the amendment, withdrawal of this rejection is respectfully requested.

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In addition, claim 80 was rejected under 35 U.S.C. § 112, 1<sup>st</sup> paragraph, for an alleged lack of support for the sequence of layers. This rejection is respectfully traversed. Figure 4 and the description in the specification from page 12, line 26 to page 13, line 8 provides support for the layers. Accordingly, withdrawal of this rejection is respectfully requested.

F. The Rejection under § 112, 1<sup>st</sup> paragraph, over the term "adjustable etching component" is Addressed

Claims 80–93 were rejected under 35 U.S.C. § 112, 1<sup>st</sup> paragraph, as allegedly lacking support and enablement for the term "adjustable etching component." This rejection is made moot by the amendment.

While support and enablement for the adjustable etching component is believed to be provided in the specification, the amendment to claim 80 eliminates the recitation of this element. Accordingly, withdrawal of this rejection is respectfully requested.

G. The Rejection under § 112, 2<sup>nd</sup> paragraph, over the term "based" is Addressed

Claims 80–93 were rejected under 35 U.S.C. § 112, 2<sup>nd</sup> paragraph, as allegedly being indefinite for including the term "based" in claim 80. This rejection is made moot by the amendment to claim 80, which eliminates the term. Accordingly, withdrawal of this rejection is respectfully requested.

H. The Rejection under § 112, 1<sup>st</sup> paragraph, over the "first" and "second" plasma based processes is Addressed

Claims 80–93 were rejected under 35 U.S.C. § 112, 1<sup>st</sup> paragraph, as allegedly lacking support and enablement for the terms "first" and "second" plasma based process. This rejection is traversed in light of the amendment.

The amendment to claim 80 replaces the first plasma based process with a "HDPCVD process" and the second plasma based process with a "different plasma process." Support for the amendment is found in the specification page 12, line 26 to page 13, line 4, which states:

The HDPCVD of layer 38 is performed until gap 36 is substantially filled with a material that is preferably high density oxide having

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essentially no voids therein. By essentially void free the inventors mean that when compared with a conventionally deposited oxide layer, the HDPCVD oxide layer will be substantially free of voids. As shown in Fig. 4, the gap may be filled to the level of the top of protective layer 26. Depending on the subsequent processing steps to be performed, the area above the deposited layer 38 may next be filled with layer 40. The layer 40 may be selected from a variety of materials and formed using a variety of techniques. *Preferably, the layer 40 is a PECVD oxide layer, which may be deposited at a higher speed than is typical of present HDPCVD processes.*

This passage in the specification provides clear support and enablement for depositing dielectric materials using a first plasma process (e.g., HDPCVD) followed by a second plasma process (e.g., PECVD). Accordingly, withdrawal of the rejections of claims 80-93 under 35 U.S.C. § 112, 1<sup>st</sup> paragraph, is respectfully requested.

I. The Rejections of Claims 50, 52-61, and 63-69 over *Tobben* are Addressed

Claims 50, 52-55, 59-61, and 63-69 were rejected under 35 U.S.C. § 102(e)/103(a) over *Tobben*. In addition, claims 56-58 were rejected under 35 U.S.C. § 103(a) over *Tobben*. These rejections are respectfully traversed.

Claims 50 and 61 include adapting the thickness and composition of the cap layer such that:

said cap layer has a thickness and a composition which are adapted so that at least during a photolithographic process said cap layer uses an interference behavior to reduce reflections.

This element is neither taught nor suggested by *Tobben*. There is no suggestion that cap layer 16b in *Tobben* acts with an interference behavior to attenuate light. Moreover, there is nothing in *Tobben* that even suggests light from photolithographic processes can adversely affect the integrity of mask patterns. Thus, claims 50 and 61 are allowable over *Tobben*. For at least the same reasons, claims 52-60 and 63-69 (which depend from claims 50 and 61, respectively) are also allowable over *Tobben*. Accordingly, withdrawal of the rejection of claims 50, 52-55, 59-61, and 63-69 under 35 U.S.C. § 102(e)/103(a) over *Tobben*, and claims 56-58 under § 103(a) over *Tobben*, is respectfully requested.

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J. Conclusion

In view of all of the above, claims 50-74 and 78-97 are believed to be allowable and the case in condition for allowance, which action is respectfully requested. Should the Examiner be of the opinion that a telephone conference would expedite the prosecution of this case, the Examiner is requested to contact Applicant's representative at the telephone number listed below.

Please charge deposit account 50-1123 the \$18 fee for adding an additional claim under 37 C.F.R. § 1.16(c). No other fees are believed to be required with this Response, and should any be required, please charge them to Deposit Account 50-1123. Should any extension of time be required, please consider this a petition therefore and charge the required fee to Deposit Account 50-1123.

Respectfully submitted,

February 3, 2004



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Attorney Docket No. UMC-96-279 CON  
Client/Matter No. 81848.0016.001

In re application of: Chih-Chien LIU, et al.

Serial No. 09/546,174

Filed April 11, 2000

For HIGH DENSITY PLASMA CHEMICAL VAPOR DEPOSITION PROCESS

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Transmitted herewith for filing is an Amendment in the above-identified application.

☐ No additional fee is required.

The fee has been calculated as shown below:

(Col. 1)		(Col. 2)		(Col. 3)	SMALL ENTITY		OTHER THAN A SMALL ENTITY	
	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NO. PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE	ADDIT. FEE	RATE	ADDIT. FEE
TOTAL	45	MINUS	44	= 1	x 9 =	\$	x 18 =	\$ 18.00
INDEP.	3	MINUS	3	= 0	x 43 =	\$	x 86 =	\$ 0
FIRST PRESENTATION OF MULTIPLE DEP. CLAIM					+145 =	\$	+290 =	\$ 0
					TOTAL	\$	TOTAL ADDIT. FEE	\$ 18.00

\* If the entry in Col. 1 is less than the entry in Col.2, write "0" in Col. 3.

\*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, write "20" in this space.

\*\*\* If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, write "3" in this space. The "Highest Number Previously Paid For" (Total or Independent) is the highest number found from the equivalent box in Col. 1 of a prior amendment or the number of claims originally filed.

☒ Please charge my Deposit Account No. 50-1123 in the amount of \$ 18.00. A duplicate of this sheet is attached.


☐ A check in the amount of \$ \_\_\_\_\_ is attached.

☒ The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any overpayment to Deposit Account No. 50-1123. A duplicate copy of this sheet is attached.

☒ Any filing fees under 37 CFR 1.16 for the presentation of extra claims.

☐ Any patent application processing fees under 37 CFR 1.17.

Dated: February 3, 2004

  
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In re application of: Chih-Chien LIU, et al.  
 Serial No. 09/546,174  
 Filed April 11, 2000  
 For HIGH DENSITY PLASMA CHEMICAL VAPOR DEPOSITION PROCESS

Commissioner for Patents  
 P.O. Box 1450  
 Alexandria, VA 22313-1450

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The fee has been calculated as shown below:

(Col. 1)		(Col. 2)		(Col. 3)	SMALL ENTITY		OR	OTHER THAN A SMALL ENTITY	
	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NO. PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE	ADDIT. FEE		RATE	ADDIT. FEE
TOTAL	* 45	MINUS	** 44	= 1	x 9 =	\$		x 18 =	\$ 18.00
INDEP.	* 3	MINUS	*** 3	= 0	x 43 =	\$		x 86 =	\$ 0
1a FIRST PRESENTATION OF MULTIPLE DEP. CLAIM					+145 =	\$		+290 =	\$ 0
					TOTAL	\$		TOTAL ADDIT. FEE	\$ 18.00

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Dated: February 3, 2004

  
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